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DEFENSE SCIENCE BOARD TASK FORCE
ON THE
REVIEW
OF THE
DEFENSE NUCLEAR AGENCY
TECHNOLOGY BASE PROGRAM

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REVIEW OF THE DEFENSE NUCLEAR AGENCY TECHNOLOGY BASE PROGRAM

April 1982

Office of the Under Secretary of Defense for Research and Engineering
Washington, D.C. 20301



A-1



DEFENSE SCIENCE
BOARD

OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

23 April 1982

MEMORANDUM FOR SECRETARY OF DEFENSE
CHAIRMAN, JOINT CHIEFS OF STAFF

THROUGH: UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING

SUBJECT: Final Report of Defense Science Board Task Force
Review of the Defense Nuclear Agency (DNA) Technology
Base Program

The attached final report of the Defense Science Board Task Force Review of the DNA Technology Base Program was prepared under the Chairmanship of Professor John Deutch. The purpose of the study was to examine DNA's responsiveness to DoD needs and the appropriateness of its emphasis on emerging technologies, and to evaluate the relationships between DNA and Department of Energy laboratories, private consultants, university participants and Service users. Additionally, the Task Force addressed important technical and management issues confronting DNA.

The Task Force concluded that DNA has in fact been responsive to DoD needs, although the technology base program does have a few specific areas of weakness. The Task Force expressed support of recent DNA initiatives to assign greater priority to the survivability of Theater Nuclear Forces and their associated C3. Also emphasized were the importance of underground nuclear testing and the need for a review of several questions left unanswered by the ban on atmospheric testing.

Among the principal recommendations of the Task Force are:

- o Resources provided to the DNA technology base longer term programs should not be diverted into more pressing short-term projects.
- o Relationships between DNA and other DoD and DoE laboratories should be strengthened by exchange programs of technical personnel.
- o Technology transfer between DNA and the Services and the CINCs should be improved by annual reviews of user requirements and joint funding of projects where appropriate.

o The DSARC process should be modified to include formal consideration of nuclear survivability of systems under development.

Other key recommendations are spelled out in the Executive Summary of the report. I recommend that you review the Executive Summary.



Norman R. Augustine
Chairman

Attachment:
Final Report



OFFICE OF THE SECRETARY OF DEFENSE
WASHINGTON, D.C. 20301

DEFENSE SCIENCE
BOARD

17 FEB 1982

Mr. Norman R. Augustine
Chairman, Defense Science Board
Office of the Secretary of Defense
The Pentagon, Rm 3D1034
Washington, D. C. 20301

Dear Norm:

This letter transmits the report of the Defense Science Board Review Group of the Defense Nuclear Agency Technology Base Program. Our Review Group has met since July 1981 with excellent cooperation from the DNA staff and with the full support of LTG Harry Griffith, the Director of DNA. The salient findings and recommendations of the Review Group are included in the Executive Summary at the front of the report. We trust that you will find the report and its recommendations cogent and that you will urge implementation of its findings to the Undersecretary of Defense (R&E).

As you know, nuclear weapons effects are growing in importance. The need to assure the survivability and effectiveness of new strategic nuclear systems and theatre nuclear systems as well as their associated C³I will be a continuing concern to both weapon systems developers and field commanders. It is both appropriate and necessary for there to be a defense agency dedicated to nuclear weapons effects technology. Our Review Group's objective has been to present recommendations that will strengthen the agency's ability to fulfill its critical responsibilities and that will improve the agency's effectiveness.

Sincerely,

JOHN DEUTCH
Chairman
Task Force on DNA TBP

1 Enclosure
As Stated

IMPLEMENTATION PLAN

SUBJECT AREA: Personnel

Recommendation:

1. Approximately 20 non-SES slots be made available to DNA to acquire new technical personnel to meet requirements and to attract young professionals with new ideas into the Agency.

Responsible Office: OSD/MRA&L

SUBJECT AREA: Technology Transfer

Recommendation:

1. Establish a formal annual process to assure consideration by DNA of Service requirements, identification of opportunities for joint funding and determination of projects and technologies that are suitable for termination or transfer to the Services with no further DNA support.

Responsible Office: Service, DCS/RD&A

2. Review the magnitude and distribution of DNA's programs at DoD laboratories with the objective of broadening this effort, especially through cooperative programs, and establishing a program to permit civilian technical personnel to spend a tour of duty at DNA.

Responsible Office: Service, DCS/RD&A, and Service Laboratory Directorates

SUBJECT AREA: Technical Issues

Recommendation:

1. USDRE establish and chair a committee with representation from DNA, USAF, USN, and special projects to develop a long-range satellite vulnerability R&D program.

Responsible Office: USDRE/DUSD(C3I)

2. Establish a joint DNA/DoE (Defense Programs) technical working group to formulate alternative programs for a national X-ray simulation technology program.

Responsible Office: USDRE

3. The DSARC (and equivalent Service mechanisms; i.e., ASARC, NSARC, AFSARC) be modified to include formal consideration of nuclear vulnerability at one or more milestones, with technical analysis support provided by DNA.

Responsible Office: USDRE

SUBJECT AREA: Intelligence

Recommendation:

1. Confirm the need and propriety of DNA's intelligence activities within established guidelines.

Responsible Office: USDRE in consultation with USDP

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Defense Science Board Task Force Review on the
Defense Nuclear Agency Technology Base Program

I. Executive Summary The DSB Review Group on the DNA Technology Base Program was established in July 1981 by Undersecretary Richard DeLauer in response to a request by Lieutenant General Harry Griffith, Director, DNA. The motivation for the study was the recognized importance of understanding the degree of nuclear survivability and effectiveness of new strategic and theatre nuclear force (TNF) systems that will form the backbone of the US and allied defense posture during the coming two decades.

The Terms of Reference invited inquiry into broader aspects of the DNA technology base program. The DNA technology base program (\$290M in FY 82) includes all DNA activities in nuclear weapons effects (NWE) research and underground testing (UGT) but does not include stockpile management activities. Four specific questions are raised in the Terms of Reference: (a) DNA's responsiveness to DoD needs; (b) appropriate emphasis on emerging technologies; (c) the balance between industry, DoD/DoE laboratory, and university performers in the DNA program; and (d) the effectiveness of technology transfer from DNA to service and CINC users. In addition to addressing these questions the Review Group was especially concerned with identifying important technical and management issues concerning the performance of DNA.

The study procedure consisted of the Review Group receiving briefings from the DNA technical staff as well as from DNA Field Command and the Armed Forces Radiobiology Research Institute (AFRRI). The Review Group then met, in turn, with key sponsors, users, and performers of the DNA program. In addition several members of the Review Group undertook separate, brief, inquiries into particular aspects of DNA's activities.

The report begins with three important observations by the Review Group. The first concerns the critical nature of NWE technology base programs in achieving a realistic appraisal of nuclear survivability of weapon systems and their associated C³. Second, the Review Group expresses support for two recent initiatives taken by General Griffith. These initiatives concern the greater priority being given to TNF survivability and the steps underway to improve DNA relationships with the services. Finally, the Review Group emphasizes the importance of underground nuclear tests to appraising nuclear vulnerability. Moreover, the Review Group suggests that it would be useful to review on the basis of today's knowledge what questions are being left unanswered by the ban on atmospheric testing.

With regard to the specific questions raised in the Terms of Reference the Review Group found that DNA's technology base program is encouragingly strong although there are some signs of weakness. The program is strong in terms of the coverage of key NWE technologies and the technical competence of the research. The two principal causes for the weakness are: (a) The preoccupation with near term system requirements reduces attention to the technology base and represents a constant threat to resources available for the technology base and (b) an unfulfilled need for technical staff, both military and civilian, to deal with increasingly complex scientific and engineering questions.

The deteriorating technical capability of the military staff is very disturbing. To the extent that this trend reflects reduced emphasis by the services on technical nuclear specialities in officers' career development, it is very far reaching. The Review Group *suggests* that OSD undertake a comprehensive study of the need for utilization of nuclear trained officers in the services.

With regard to civilian technical personnel the Review Group *recommends* (#1) that approximately 20 non-SES slots be made available to DNA to acquire new civilian technical personnel to meet new requirements, maintain corporate memory in NWE phenomenology and to attract young people with new ideas into the agency.

The Review Group believes that if resources provided keep up with inflation and if major new requirements are accompanied with additional resources DNA should be able to maintain a healthy technology base program. The Review Group *recommends* (#2) that resources provided to DNA increase in proportion to the cost of living and new near-term system requirements; long term technology base resources should not be diverted to meet more pressing short term problems.

The Review Group finds that DNA has been responsive to DoD needs. DNA's record in meeting the needs of the CINC's is particularly strong because of DNA's willingness to apply its financial and technical resources directly to the CINC's perceived problems. DNA's record with the services is understandably less good. The reason is that DNA raises technical questions about nuclear survivability during system development and acquisition that places costs and uncertainty in front of the program manager. Improvements in the DNA-service relationship are desirable. More extensive and continuous DNA/service contact should help and there is evidence that the present DNA leadership is moving in this direction.

The Review Group believes that there are two important issues concerning the balance among DNA performers. The first concerns the relationship between DNA and DoE laboratories. The relationship has improved over the past long history of "turf" battles but the opportunity for improvement still exists. There is excellent cooperation in execution of the UGT program and when DoE labs perform work for DNA as contractors. However, DNA and DoD should make greater use of DoE when designing nuclear weapons experiments and in the consideration of advanced simulation technology.

Recommendation #3 includes certain practical measures that would improve the interaction between DNA and DoE labs to the mutual benefit of both parties. (See pages 17-18.)

The second issue concerns the role of the top private contractors in the DNA program. In general the Review Group believes there is strong competition among this group and that it is inevitable and desirable that a relatively small contractor community possess the bulk of specialized NWE expertise. The relationship between DNA and its contractors has been most productive in the past, but in order to avoid the appearance of conflict of interest it is recommended (#4) that DNA seek broader representation on its technical advisory groups and the SAGE.

While the Review Group encourages DNA to seek the participation of outstanding university investigators in the more fundamental aspects of its program it must be recognized that university participation is likely to remain limited.

The final question in the Terms of Reference concerns the effectiveness of DNA's effort in technology transfer. The Review Group *recommends (#5)* a strengthening of DNA-service and DNA-CINC technology transfer by re-establishing a formal annual process to assure DNA consideration of service requirements and identification of opportunities for joint funding. But the more profound barrier to effective technology transfer to the services and the various system development program managers is the deteriorating technical capability in NWE among military officers and in the service development laboratories. The Review Group *recommends (#6)* that DNA review their programs at service laboratories with a view to strengthening NWE competence in these labs, especially through joint projects.

The Review Group identified five key technical issues. The first concerns the relative strengths and weaknesses of the DNA technology base program. The Review Group found that the nuclear effects data base was being appropriately maintained and that UGT's were being

executed properly. The areas of (1) shock physics and dust, (2) high altitude effects, (3) structural vulnerability and hardening, (4) electronic effects, (5) radiation simulation techniques and (6) nuclear weapons targeting and policy studies were relatively strong. The areas identified as less strong include (1) analysis of EMP coupling and effects including SGEMP, (2) aircraft EMP, (3) advanced instrumentation for UGT's, (4) human response to combined weapons effects, and (5) collateral effects of nuclear strikes. The Review Group stresses the importance that it places on seeing DNA treat NWE as an engineering/scientific discipline throughout its research program.

(Recommendation #7). The second technical issue concerns satellite vulnerability. The US is increasingly dependent on satellites both for communications and, more importantly, intelligence and warning. Satellite EMP vulnerability is important but not paramount; for example direct attack remains of great concern. The recent UGT HURON KING indicates the need to improve understanding of satellite hardening issues that requires focused attention. The Review Group recommends (#8) USDRE chair a joint committee with DNA, USAF, and USN representation to develop an acceptable long-range satellite vulnerability R&D program.

The issue of satellite vulnerability to EMP includes the question of the need for a satellite X-ray test facility (SXTF). In fact, SXTF is part of a broader issue concerning the development of advanced simulators.

Over the long run, there is certain to be a continued need for expensive simulator facilities. The government will not be able to afford separate programs for DoD and DoE. Accordingly the Review Group recommends (#9) that prompt attention be given to establishing a joint DoD/DoE technical working group to formulate alternative programs for a national X-ray simulation technology program.

The third technical issue concerns the role of DNA in the DSARC process. The Review Group notes with concern that the acquisition process does not include the consideration at any specific time of the nuclear survivability of weapon systems. The Review Group recommends (#10) that the DSARC (and equivalent service mechanisms) be modified to include at one or more milestones, formal consideration of nuclear vulnerability. DNA should be charged with the responsibility of providing a nuclear vulnerability analysis to the DSARC.

The fourth technical issue concerns DNA's program for policy studies and nuclear employment policy. The Review Group (recommendation #11) strongly endorses DNA's policy study/systems analysis effort and notes the contribution this effort has made to senior OSD officials, to the formulation of the DNA research program, and to operational commanders. The Review Group also suggests that OSD and the JCS should assure more effective participation by DNA in on-going government deliberations on nuclear targeting policy and arms control.

Finally, the Review Group reviewed the performance of the Armed Forces Radiobiology Research Institute (AFRRI) and found it satisfactory. Certain suggestions are included in the report for possible future activity by AFRRI.

The Review Group identified four key management issues concerning DNA's past performance. The first issue is the appropriateness of the present DNA mission. The Review Group believes that the present DoD directive, properly interpreted, is an appropriate charter for DNA; a single possible desirable modification would be to include a statement on DNA's role in the acquisition process. The Review Group recommends (recommendation #12) that DNA's charter not be expanded to include primary responsibility for CW/BW or advanced conventional munitions. However, the Review Group supports DNA's undertaking CW/BW and advanced conventional munitions work insofar as it is necessary to dealing with problems of the integrated battlefield.

The Review Group examined the DNA organization and present reporting relationship. While the Review Group was concerned whether the present organization was conducive to attracting the strongest possible technical competence, the group was unpersuaded that any feasible organizational change would benefit the agency. Accordingly, the Review Group proposes no change in the DNA organizational arrangement.

The third management issue concerns DNA's role in intelligence analysis which has been under criticism by DIA and by the Defense Audit Service (DAS). The Review Group has reviewed this problem in detail and recommends (#13) that the Undersecretary of Defense (R&E), after consultation with the Undersecretary (Policy), confirm both the need and propriety of DNA's intelligence activities within the following guidelines: DNA should not issue finished intelligence without specific authority from DIA. Conversely, DIA should not issue finished intelligence reports that deal with nuclear weapons effects without DNA coordination. DNA is encouraged to continue to sponsor analyses based on intelligence data provided such analyses are clearly marked as "not finished intelligence."

The final management issue concerns DNA's past procurement practices. The Review Group is concerned that the reaction to critical DAS and GAO reports, will lead DNA to adopt less responsive and flexible contracting procedures. All DNA performers have commented that DNA's past contracting practice has contributed to the Agency's success and its ability to attract the most talented research groups. The Review Group cautions against loss of contracting flexibility and recommends (#14) that the process of unsolicited proposals received in response to notices of program interest published in Commerce Business Daily be recognized as a legitimate means of providing for competition in the DNA program. This does not imply that unsolicited proposals would only be accepted in response to CBD notices.

II. Introduction The mission of the Defense Nuclear Agency (DNA) is to provide support to the Secretary of Defense, the Military Departments, the Joint Chiefs of Staff, and other DoD components in matters concerning nuclear weapons. The responsibilities of DNA include (a) management of the DoD nuclear weapons stockpile, (b) nuclear weapons effects research programs including DoD nuclear weapons effects tests, and (c) providing staff advice to appropriate DoD authorities as requested. The organization, mission, and responsibilities of DNA are set forth in DoD Directive 5105.31 which is included in Annex A.

It is evident that DNA will be providing particularly critical functions during this decade as the US and its allies field major new nuclear weapon systems. In particular it is essential that the US understand the degree of survivability of these new systems and their effectiveness in a nuclear environment. The appraisal of survivability and force effectiveness in a nuclear environment must be made at the systems level so that questions of C³ survivability and targeting methodology are addressed. Accordingly, DNA's concern goes beyond narrow technical considerations of weapon system or weapon system component vulnerability to blast, shock, and radiation. While these are its appropriate prime concerns, to be most effective, DNA studies and analyses must take into account consideration of the overall survivability and effectiveness of US and allied forces. In order to adequately fulfill its responsibilities and mission DNA must devote some attention to broader policy considerations and participate in the analyses of enemy threats against our weapon platforms and their effectiveness.

At present, there are two areas that deserve top priority in DNA's program. The first concerns the assessment of survivability to nuclear effects for the new strategic nuclear programs including

especially M-X, the bomber force, and associated C³. The second area is relatively new for DNA; it is the assessment of the survivability and effectiveness of theatre nuclear forces (TNF) operating in a combined arms environment.

The Director, DNA, Lieutenant General Harry A. Griffith, USA, recognizing the new demands that DNA would be facing, requested the Defense Science Board (DSB) to mount a one-time external review to examine the adequacy of the DNA nuclear weapon effects technology base programs to meet future requirements. While the focus of the review was to be the state of health of the technology base, the Terms of Reference, included in Annex B, invited and expected inquiry into broader aspects of the DNA program.

The DSB/DNA Review Group was formed under the chairmanship of John Deutch in July 1981. A complete list of members is included in Annex C. The membership of the Review Group included several individuals who are also members of the standing DNA Scientific Advisory Group on Effects (SAGE) in order to assure the participation of those experienced in DNA programs and history.

A. Objectives of the Study The motivation for this DSB Review arose from a concern that DNA's technical competence has been deteriorating and that the DNA research program had drifted in recent years into inappropriate areas with a restricted set of performers. The Terms of Reference issued by Undersecretary Richard DeLauer are quite broad but include four questions that reflect the concern just mentioned:

(a) Is DNA's technology base program responsive to DoD needs for nuclear weapons effects information?

(b) Is the proper emphasis being placed on emerging technologies?

(c) Is there an appropriate balance in the use of government laboratories, industry and university performers?

(d) How can the effectiveness of DNA's information and technology transfer effort be improved.

In order to answer these questions and to meet the more fundamental objectives of the inquiry the Review Group placed particular attention on the following:

(i) assessing the technical quality of recent DNA programs.

(ii) evaluating current DNA plans for meeting future requirements.

(iii) examining alternative ways of doing business that might improve DNA's performance.

In pursuing the study, the Review Group was especially concerned with gathering 'issues' concerning the DNA program. Much of the deliberations of the Review Group consisted in understanding the nature of these issues and formulating comments and/or recommendations for their resolution.

B. Study Procedure

The procedure followed by the Review Group during the study was to meet with various elements of the DNA community. The Review Group was initially briefed by the various elements under the Deputy Director (Science and Technology) including the Nuclear Assessment, Shock Physics, and Radiation Directorates. Presentations were heard from DNA Field Command and from the Armed Forces Radiobiology Research Institute (AFRRI). The Review Group then proceeded to meet in turn with (1) some principal sponsors in the Office of the Secretary of Defense and the Joint Chiefs in order to assess the perception of selected key DoD officials about the quality and responsiveness of DNA; (2) some important past and present users of the DNA program output in the services and especially in the Unified and Specified Commands, e.g., CINCPAC, CINCSAC, JSTPS, EUCOM; (3) some major performers of DNA sponsored research including representatives of DoD and DoE laboratories as well as industry. The Review Group's meetings and agendas as well as a complete list of individuals with whom the Group met is included in Annex D.

Throughout the discussions of the Review Group with the DNA staff and with the sponsors, users, and performers of the DNA program, an effort was made to identify major issues. The Review Group was pleased that the Director of DNA, General Griffith was present for essentially all of the proceedings. Not only did the Director's contributions sharpen the deliberations of the Review Group, it also assured that a major aspect of the study's objective will be successful. The Director of DNA and the Deputy Director (S&T) were present during the independent in-depth review and therefore are aware of the reasoning behind the Review Group's findings and recommendations. They will be in a favorable position to implement the Review Group's recommended actions.

In addition to the meetings described above, the Review Group undertook through the efforts of individual members some brief special inquiries. Important examples include (1) the visit of Dr. Harold Lewis to AFRRI, (2) the case study by Conrad Longmire of the underground test HURON KING to determine the adequacy of theory and analysis in regard to Systems Generated EMP (SGEMP), both pre- and post-shot, and (3) the consideration of DNA relationships to both DoE and DoD laboratories undertaken by Rear Admiral Wertheim, USN (Ret) and Dr. Donald Kerr. The results of these and other special efforts were integrated into the Review Group's deliberations and consequently they are reflected in this report.

C. Outline of the Report The body of this report consists of four chapters. The next chapter, Chapter III, presents some observations that Review Group wishes to make concerning DNA's mission and present initiatives. The fourth chapter responds to the Undersecretary's charge to the Review Group and addresses directly the four questions posed in the Terms of Reference.

The following two chapters, Chapters V and VI, contain the major results of the review. Both chapters are formulated in terms of findings and recommendations with regard to selected issues concerning the DNA program identified by the Review Committee. Chapter V is devoted to five technical issues and Chapter VI is devoted to four management issues.

III. Observations of the Review Group Concerning DNA's Mission.

The Review Group believes it helpful to stress the importance of DNA's mission. Understanding the vulnerability of weapon systems and their associated C³ to nuclear weapons effects is essential to a proper appraisal of survivability. Understanding nuclear weapons effects per se is essential to the design of weapon systems and to the establishment of requirements for their deployment. Both types of questions (survivability and weapons effectiveness) are important determinants of major defense programs and play a prominent role in many policy debates. Examples include MX survivability, B-52 versus B-1 EMP hardness etc; all subjects where DNA has major programs. From this perspective it is quite understandable that the Director, DNA and other senior DoD officials are interested in assessing the technical strength of the DNA program.

Erosion in the strength of the technology base of any organization may result from many factors. Included among these are (1) inadequate resources to meet immediate requirements as well as future needs, (2) poor technical direction, (3) imbalance in program content, (4) deterioration in technical competence in either the organization's technical staff or in its performers, and (5) poor transfer of technology and technical information to the user. Members of the Review Group were sensitive to all these different types of weakness that can appear in a technical organization and the Group's intention was to discover any examples of these weaknesses that it could. This objective was strongly encouraged by General Griffith. Particular attention was given by the Review Group to the questions (1) Is the rapid rise in near term requirements adversely affecting the technology base? and (2) Has there been a decline in the competence of the technical staff (both civilian and military)?

The Director of DNA also informed the Review Group of two initiatives that he is undertaking. The first initiative concerns theatre nuclear forces and the survivability and effectiveness of weapon systems in a combined arms environment. General Griffith believes that the priority DNA gives to theatre nuclear forces (and their associated C³) must be increased to match more closely the priority given to strategic nuclear systems. Second, General Griffith has taken systematic steps to improve relationships between DNA and the users of their product, particularly the services. The Review Group was supportive of both these initiatives and believes that they will contribute significantly to improved performance by DNA. In particular, the steps that General Griffith is taking with regard to the services, especially in the area of defining program requirements, will meet some problems discussed below.

Finally, the Review Group wishes to state the importance it places on nuclear weapons testing. While the Review Group was pleased to note the existence of the Augmented Test Program and the cooperation between the DoD and DoE in executing the Underground Test Program it was struck by the need to balance the requirements for weapons design information with concerns with system vulnerability. In view of the increasing emphasis on strategic C³ (\$188 in 5 years), the Group believes that more attention should be given to weapons effects measurements in both DoD and DoE tests. This would require substantial DoE and DoD cooperation in the design of experiments as well as in their execution.

During the Group's deliberations there were innumerable examples where important knowledge was absent and could only be practically obtained through nuclear tests. Such tests, of course, are not ends in themselves but rather verification experiments that confirm theoretical and laboratory programs as well as provide an opportunity to reveal unexpected phenomena. At the present time UGTs are the only way of achieving radiation fluxes at maximum threat levels in order to certify components and systems. Indeed, there are certain important questions involving full-up system tests, e.g., bombers, silos, satellites, that are not possible in the absence of atmospheric testing. The knowledge that his design will be subjected to a nuclear weapons effects test constitutes a very real motivation for the designer to pay careful attention to those details which minimize the risk of test failure. Since this need to survive the test is a less ambiguous requirement than meeting hardening specifications, it serves as an important discipline on the development team. For all these reasons, the Review Group believes that maintenance of an aggressive UGT program is absolutely essential.

With regard to atmospheric testing, the Group is not insensitive to the major political problems which would be associated with resumption. Nevertheless, since the Review Group's frame of reference relates to the technical adequacy of US knowledge in nuclear effects (and of DNA's ability to supply this knowledge), the Review Group believes it would be useful to review on the basis of today's knowledge, what questions are being left unanswered by the restriction to the underground environment. If these questions are of major importance in the sense that lack of high confidence data could compromise the survivability in effectiveness of US weapon systems and associated C³I and, further, if it can be demonstrated that answers might be provided through atmospheric testing, senior policy officials should be so apprised. The Group's motivation in offering this suggestion is not to argue that the present testing constraint is acceptable or unacceptable. Rather, the Group is concerned that an in-depth technical appraisal based on today's knowledge of weapons effects, nuclear survivability requirements, and testing methods, has not been undertaken.

The Review Group notes that DoE and DNA are responsible for nuclear weapons test readiness. This means that DNA should have in place the plans and standby capability to mount enhanced test programs including atmospheric tests should future considerations demand these actions. It is now widely recognized that DNA no longer possesses this standby capability because resources adequate for this purpose have not been provided. This fact, and its possible consequences, should be made clear to the highest authority with a strong recommendation for corrective action. Either we should have the program to support the policy or we should change the policy.

IV. Response to Questions Raised in the Terms of Reference.

In this chapter the Review Group responds to the critical questions raised in the Terms of Reference.

Questions (a) and (b):

(a) Is the DNA Technology Base Program responsive to DoD needs for nuclear weapons effects information?

(b) Is proper emphasis being placed on emerging technologies? High risk/high pay-off areas?

The Review Group's net judgement is that the DNA's technology base program is encouragingly strong although there are some signs of weakness. The Review Group believes that in most areas the DNA technology base program is adequate. Examples where there is particular strength is shock and blast, dust phenomenology, radiation

physics, and nuclear weapons effects data management. Specific weaknesses in subject matter are discussed in the next chapter. Furthermore the Review Group notes that DNA is placing emphasis, in selected areas of importance to their mission, on emerging technologies that could have higher pay-off. A notable example includes work on X-ray simulation techniques based on inertial confinement fusion.

The Review Group concludes as a result of discussion with several sponsors and users of DNA's technology base product that DNA is responsive to DoD needs. Welcome efforts are underway to strengthen the DNA/services relationships. There are two important categories of users that speak eloquently of DNA's responsiveness and the value of DNA's product. Representatives of several Unified Commands testified to the importance of DNA's work. Examples include ADM Long, CINCPAC; GEN Blanchard ex-EUCOM, MG Enny, CINCSAC, etc. Similar supportive testimony was received by past and present OSD officials, e.g., Andy Marshall. Clearly in a situation of this kind it is unrealistic to expect everybody involved will be enthusiastic; but the fact remains that the overwhelming majority of users are satisfied.

There are several reasons why DNA has had this success with these sponsors. First, the JCS Unified Commanders have no resources to support much needed direct technical support on such problems as theatre nuclear weapons targeting, C³ improvements, etc. Second, DNA has demonstrated a willingness to mount projects that include hands-on work with the Commands. This increases the value of DNA work since it is easily adopted in the field. The result is that DNA's work has been responsive and of great value to JCS field commanders and to senior OSD officials.

The DNA record with the services is less good. Each year DNA invites service inputs for possible inclusion in the DNA program. It is quite understandable that complete agreement is not reached between DNA and the services about what should be funded. On the one hand DNA seeks projects that develop technology for solution of generic problems that services may adopt. On the other hand the services have limited resources, are under pressure to develop capabilities usually against stringent time and cost constraints, and therefore are understandably inclined to seek DNA technical and fiscal resources to meet their most pressing needs (and incidentally to obtain funding for their laboratories). Such tension can be constructive. However there is some evidence that the mechanism by which DNA considers service proposals has become less systematic in recent years. The Army is particularly concerned with this trend. The Review Group welcomes the steps DNA has taken to improve the process for consideration of service program requests; some additional suggestions are included in response to question (d).

An important generalization can be made concerning the success of DNA with DoD users. When DNA brings its resources to an operating command and mounts an effort aimed at fielded systems, the relationship is almost always excellent. When DNA interacts with a service on system development, the relationships are more strained. The reason for this pattern is easy to understand. In the former case DNA is helping to solve a perceived problem; in the latter case DNA is playing a role in establishing a requirement that must be met, at some cost, by the service program manager or SPO with service resources.

The Review Group believes that each service must be charged with the responsibility of working trade-offs between the various elements of a program. DNA should have the responsibility to stimulate service NWE survivability requirements, and to validate that a particular level has been achieved. To accomplish this, ties between DNA and the services must be strengthened; for instance, a senior technical officer of each service should sit on the SAGE.

The Review Group notes two principal causes for deterioration of the strength of DNA's technology base program. These are (a) near term system requirements pushing out resources available for the technology base and (b) an unfulfilled need for technical staff, both military and civilian, to deal with increasingly complex scientific and engineering questions.

It should be noted that all DNA R&D activities, i.e., activities other than stockpile management, are categorized as 6.2 exploratory development. Thus the term "technology base" in the context of the DNA program must be interpreted to include (1) Nuclear weapon effects research, (2) test, and (3) survivability and security of theatre nuclear weapons. These are the three program sub-elements of the DNA program and they are collectively referred to in the DoD budget as the "technology base" of DNA.

It is evident that not all these DNA resources of \$290M in FY 82 (for a budget profile see Annex E) qualify equally as long-term technology development. For example a substantial fraction of these resources are devoted to underground nuclear tests (\$69M in FY 82) and to the operation of important EMP and γ -ray facilities (e.g., ARES and AURORA) that are the "overhead" for R&D advances. Moreover, many of DNA projects address short-run questions of immediate interest, e.g., silo hardness (in contrast to work on structural dynamics), A-7 EMP testing, and support to operating commands. While the Review Group examined the entire range of these "technology base"

activities at DNA, it was particularly concerned, in response to its charge, with assessing those activities that contribute to the long-term technological capability of the agency for understanding nuclear weapons effects. The significance of this knowledge for practical improvement in weapon system survivability and effectiveness was also of great concern to the Review Group.

While the Review Group believes the technology base program of DNA is healthy (specific suggestions for improvement are included in the next chapter) there are some trends that give reason for concern. First, it is evident that major weapon system developers and their service sponsors are progressively seeking DNA support to assess system vulnerability, especially to EMP effects. Examples include the M-X, F-15, and C-4. Second, the CINC's are more sophisticated and prepared to introduce available technology into their operations. But they need the expertise and resources of DNA to accomplish the introduction of this technology. The consequences for DNA is that there are progressively more deserving requirements placed before the agency that command a large share of resources and technical attention at the expense of the technology base and investing in high risk/high pay-off areas.

The second adverse trend identified by the Review Group in DNA's technology base program concerns the DNA technical staff. Traditionally DNA has had a substantial complement of military personnel (50% of professional staff). The Review Group believes that DNA will suffer progressively from the reduced emphasis that the services appear to be placing on technical and nuclear specialties in officers' career development. This trend, coupled with the traditional short tours of duty of military officers in technical assignments, means that not only DNA but other organizations that require sophisticated nuclear expertise, e.g., weapons development and requirements, will suffer.

There is a lack of career appeal of nuclear program billets (e.g., in DNA) to able young officers; in contrast the newest military technologies are attracting these people. This falling-off of interest may be in part the inevitable consequence of restrictions on nuclear testing. While atmospheric testing was taking place, a large body of effects data was continuously and vigorously being developed. New system vulnerability and survivability issues were being actively discovered and addressed. Community interest was keen, and the important experimental programs possible of being fielded attracted the most competent technologists and systems people. Under the severe nuclear test restraints now in place, this full-scale nuclear effects data flow has been in large part replaced by computer analysis, low similitude simulation testing, and

constrained nuclear testing. As a consequence of this altered approach to research in nuclear effects and system response, many of the brightest people may now be attracted to the supporting computer, simulator, and analysis technologies, rather than to weapon physics. The Review Group speculates that for several reasons the Soviet Union does not face a symmetrical problem. The Review Group believes that the Office of the Secretary of Defense should undertake a comprehensive manpower study of the needs and utilization of technical officers with nuclear specialty in the services.

Perhaps of greater concern is the number and quality of civilian technical manpower at DNA. While the Review Group was impressed with much of the staff, it is evident that a staff composed of 33 professionals is unlikely to be of sufficiently high quality or size for DNA to fulfill its mission, especially that concerning the nuclear weapons effect technology base. With this number of professionals, one must expect that almost all the staff's time is devoted to administrative in contrast to technical management of contracts and projects or to participation in working groups concerned with relatively near term system related requirements. But the DNA civilian technical staff must be relied upon for continuity of expertise on nuclear weapons effects technology and for the knowledge required to design and pursue new technical initiatives. Moreover, there must be sufficient staff size to permit recruitment of younger technical staff that will bring new ideas to the organization.

The Review Group does not believe that the present size of the civilian DNA staff is sufficient to assure sustained quality in the technology base effort, particularly in a time of sharply increasing requirements. Additional civilian personnel are needed in DNA to keep up with the accelerating requirements to assure adequate nuclear survivability for new systems, to provide corporate memory in nuclear effects phenomenology, and to attract young people with new ideas into the agency.

Recommendation #1 An additional number of professional (non-SES) technical personnel, approximately 20 slots, should be made available to DNA with appropriate administrative and clerical support. The Undersecretary should take immediate steps to see that this allocation is made to permit DNA to recruit new junior professionals.

With regard to the aggregate resource level provided to the DNA technology base effort, the Review Group believes that if the resources provided keep up with inflation, and if major new requirements are levied with new resources, it should prove possible to maintain a healthy technology base program with modest realignments as described in the next chapter. However, it is

important that DNA sponsors both in OSD and the JCS recognize the importance of the longer term technology base activities and protect resources allocated to this function from being diverted into more immediate and pressing problems. Thus the Review Group recommends:

Recommendation #2 Resources provided to the DNA technology base program should increase in proportion to the cost of living and near term system requirements. The Undersecretary should direct the staff he designates to oversee DNA matters to assure that longer-term technology base resources are not diverted into more pressing short-run projects.

Question (c) Is there an appropriate balance in the use of US government laboratories, industrial R&D, and universities?

The Review Group is aware of two issues concerning the balance among performers of the DNA program. The first concerns the use of government laboratories, especially the DoE weapons laboratories (Los Alamos, Livermore, and Sandia) that have a great deal of expertise in nuclear weapons effects. It is believed by some that a long history of "turf battles" between DNA (which is responsible for nuclear weapons effects R&D) and the DoE weapons complex (which is responsible for nuclear weapons development) has led DNA to use the weapons laboratories less than private contractors. The second issue concerns the reliance of DNA on a few private contractors that are viewed by some as favored in the DNA program. See Annex F for a list of major DNA contractors in FY 81.

The Review Group believes that the relationship between DNA and the DoE laboratories is generally good and a substantial improvement over the past. Two of the three DoE weapons laboratories do significant work for DNA (Sandia and LASL) and the Review Group would expect the participation of DoE labs as DNA contractors to increase in the future. Areas where this can be expected are pulsed power technology (Sandia) and laser fusion (Livermore). In both these areas DNA and the DoE labs have parallel programs based, however, on different technical approaches. While this redundancy in technical programs is frequently welcome, it is sometimes not affordable. It may prove desirable to develop joint programs between DNA and DoE in the future in these directed energy areas.

The Review Group, aware of the important operating role played by Field Command DNA, supports the recent changes made to strengthen their organization. Further, the Group views Field Command's Test Directorate as the appropriate element to assist Headquarters DNA in broadening joint test planning and experiment design activities with DoE. Increased staff for the technical liaison group at Los Alamos and Livermore would have their effectiveness enhanced if they were

more substantially involved in supporting DNA technical programs, rather than simply providing a military presence at the design laboratories. Field Command, headquartered in Albuquerque, could play a major role in coordinating DNA and DoE programs to provide future radiation simulators. This would require technical staff growth and a clear delegation of responsibility from DNA/HQ.

DNA and the three DoE weapon laboratories have many overlapping and complementary missions and tasks. These include nuclear weapon effects, nuclear tests, safety, security and safeguards, military system analysis and many others. The interaction between the labs and DNA is complex and has evolved slowly over a long period.

Some services provided by the DoE laboratories are directly funded by DNA. A listing is shown in Annex G. In general, these are activities which utilize extant laboratory capabilities, are supportive of laboratory areas of interest, and to a large degree, of mutual benefit. Some support to DNA is supplied without reimbursement. An example is the design and provision of devices and arming and firing for underground tests. Another area is provision of information to DNA and its contractors as required. Laboratory personnel participate in many DNA meetings and serve on the DNA Scientific Advisory Group on Effects (SAGE).

There are some actions which could be taken to improve the interactions to the mutual benefit of both parties. These actions include:

Recommendation #3

- (1) A regular exchange program between laboratory and DNA technical personnel.
- (2) A regular schedule of visits by DNA senior officials to the labs accompanied by comprehensive briefings on laboratory programs and capabilities.
- (3) Strengthen the DNA field offices at Los Alamos and Livermore and have them support DNA Headquarters activities.
- (4) Develop new mechanisms to encourage open exchanges on nuclear weapon effects between DNA, DoD lead laboratories, DoE, and DoD weapon system sponsors and SPOs.
- (5) Utilize more DoE and DoD laboratory personnel at DNA for in-house DNA technical program reviews to help provide technical criticism and guidance. The major goal should be to have DNA and the DoD and DoE laboratories operate in a more cooperative and supportive role.

(6) Greater participation by DoE laboratory personnel on DNA advisory groups (e.g., SAGE) and technical working groups.

(7) Similarly greater participation by DNA staff and DNA contractors in the DoE laboratory technical groups would also be useful.

The top six private contractors perform 50% of DNA's technology base (non-UGT) work. There is a welcome sense of competition between the largest DNA contractors. The Review Group further is aware that several of these contractors play a role in assisting DNA to formulate its technical program as well as a role in carrying out the program. This dual relationship has the advantage of assuring strong coupling between the technical community and the sponsoring agency.

Indeed, the Review Group believes that in a technical area as specialized as nuclear weapons effects it is inevitable that a relatively small contractor community possess the bulk of the expertise and consequently receives the bulk of the work of the Agency. But the relationship has a disadvantage of appearing to some (especially non-DNA contractors) as providing an opportunity for conflict of interest and as restrictive to competition. In fact, the evidence indicates significant turnover in DNA contractors. Nevertheless, the Review Group urges DNA to be sensitive to this situation and to take steps that safeguard the integrity of what clearly has been a productive relationship between the agency and its contractors.

Recommendation #4

The Review Group recommends that DNA seek broader participation on its technical advisory groups and the SAGE. DNA should make more of an effort to solicit views on the prospective DNA program from a larger community than the present contractors.

Comments of the Review Group on the relationship between DNA and DoD laboratories appear in the next sub-section.

With regard to the relationship of DNA to universities the Review Group believes that it would be appropriate for DNA to increase its efforts in attracting top-flight university researchers to work on long-range fundamental problems. The present level of DNA work at universities (excluding DoE labs) of \$1M in FY 81 is quite modest. There may be subjects in mechanics, fluid dynamics, electromagnetics where leading university investigators could make important contributions to the DNA program and it would be appropriate for DNA to seek this participation. But it must be recognized that there are

several reasons to expect that university participation in the DNA program will be limited. These reasons include the classified nature of the research which makes it generally inappropriate for on-campus activities; the scale of much of the experimental facilities and projects, and of course, the highly specialized nature of nuclear effects phenomenology which is not widely known on university campuses.

Question (d) How can the effectiveness of DNA's information and dissemination and technology transfer efforts be improved?

The users of DNA's product are the (1) SPO weapon system developers, (2) the services that must take nuclear weapons effects into account in their training, doctrine, plans, and operational practices, and (3) the CINC's. It is essential that DNA establish an appropriately close relationship to these users if their efforts are to make a difference and if new nuclear weapons considerations are to be efficiently introduced into the force. The relationship must be established during the formulation phase of the DNA program (as discussed in the response to question (a)) and continue during the program execution phase if a user adoption is to be facilitated.

There is a natural tendency for DNA as the technology agency to stress uncertainty, therefore the need for additional R&D, and conservative acceptance criteria. On the other hand the user has an interest in certainty, low cost, and rapid resolution of outstanding technical issues. The Review Group believes that the current relationships can be improved and, as noted earlier, welcomes General Griffith's efforts in this regard.

Two specific features hamper technology transfer to the services and other users of the DNA product. The first is the absence of adequate resources to achieve all perceived project needs. This circumstance is not new and certainly not unique to the DNA/service relationship. It does however point to the importance of user participation in the requirements process as discussed above. Accordingly the Review Group recommends:

Recommendation #5 Strengthening of DNA-service and DNA-CINC technology transfer by reestablishment of a formal annual process to assure (a) the consideration by DNA of service requirements, (b) identification of opportunities for joint project funding by the services and DNA, and (c) identification of projects and technologies that are suitable for termination or transfer to the services with no further DNA support.

The Review Group especially wishes to stress the possibilities for joint funding for projects by DNA and the services. Service willingness to share a substantial fraction of project cost should be taken by DNA as an important indication of priority.

A more serious factor limiting technology transfer from DNA to the services and the operating commands is the quality and number of technically qualified officers that can (perhaps with technical assistance) understand and put into place, either in a development program or a fielded system, new nuclear weapons effects technology. This difficulty is a profound one--it goes to the heart of an important question; namely the adequacy of nuclear trained officers in the uniformed services. The Review Group believes that the services have not maintained required nuclear expertise and recognizes that amelioration of this problem will be neither rapid or easy. The Group does however wish to point to one possibility that might help the situation especially with regard to systems in the R&D or development phase. This possibility concerns relationships between DNA and the DoD laboratories.

The distribution of DNA funds over the years has shown a continuing trend away from the government laboratories and toward industrial contractors. In the early 60's approximately 90% of DNA funds were allocated to the three services, and as recently as 10 years ago DNA funding was split about equally between the government laboratories and industrial organizations. Reference to Annex F shows that in 1981 work assigned to DoD and DoE activities combined represented only 30% of total DNA funding. Funding for work assigned the DoD laboratories is projected to continue to decline from 22% of the total in 1981 to 11% in 1984. It is not clear whether this trend is entirely a consequence of the gradual loss of qualified nuclear weapon effects technical expertise in the DoD laboratories and the diminished service emphasis on the importance of nuclear weapon effects work by their laboratories, or is to some extent one of the factors that has contributed to this undesirable situation. Nevertheless, it is a trend that should be recognized both by the Services and DNA as counterproductive to their joint objective of incorporating nuclear weapon effects technology into the acquisition of new military systems.

The government laboratories have a special role to play in supporting the development commands and SPOs as well as contributing to the technical education and training of career personnel who will be the acquisition managers of the future. A deliberate shift of DNA funding back toward the DoD laboratories would not necessarily reduce the valuable contributions to be made by DNA private contractors since it is likely that they would continue to win nuclear weapon

effects technology contracts whether placed by the service laboratories or by DNA directly. The requirement to define intelligently and direct such effort, however, should help attract and hold a more competent military and civilian technical staff at the DoD laboratories.

The Review Group believes that greater DNA sponsored activity at the service labs and exchange of technical civilian personnel between the DoD labs and DNA could well improve technology transfer. The Review Group is well aware of the limitations of these laboratories compared to much of private industry. The Group is not recommending a give away program to the DoD labs or that DNA should become a "sugar daddy" for service labs that are under funding pressure. Nonetheless, the fact remains that a necessary condition for the utilization of DNA developed technology is knowledgeable service laboratory development and SPO personnel. Accordingly, the Review Group believes that DNA technology transfer might well be improved by more DNA sponsored work (or cooperative projects) at DoD laboratories. A second useful mechanism is for DoD technical personnel to take a tour of duty at DNA. The Review Group recommends:

Recommendation #6 DNA should review the magnitude and distribution of their programs at DoD laboratories with the objective of broadening this effort, especially through cooperative projects. In addition DNA should explore with the services the possibility for establishing a program to permit civilian technical personnel to spend a tour of duty with DNA.

This concludes the response to the specific questions raised in the Terms of Reference. The next two chapters are devoted to discussion of the Review Group's findings on certain issues identified with regard to the DNA program. Chapter V is devoted to technical issues and Chapter VI is devoted to management issues.

V. Technical Issues

In this chapter five technical issues identified by the Review Group are discussed. Each of these issues represent a major concern that emerged from the group's deliberations and consumed a considerable portion of the panel's effort.

Issue A. What are the relative strengths and weaknesses in the DNA technology base program?

As mentioned earlier the Review Group was generally impressed by the technical strength of the DNA program. Several areas were of interest to one or more panel members. For example, there was

concern about the adequacy of efforts to preserve the nuclear effects data base, i.e., data collected from post-atmospheric or underground tests. While the panel did not examine this subject in detail, the general impression was that the nuclear effects data base was being appropriately maintained.

A second subject of concern was the underground test program in all its aspects: design of experiments, collection of data, and its analysis. The Review Group examined the present DNA procedures and compared these with past practices and with the conduct of DoE tests. The Review Group was generally satisfied with the scientific basis of the test program although it was noted (see issue 8 below) that a stronger theoretical effort (not simply computer effort) in both pre-shot and post-shot analysis would make the underground tests more valuable.

Dr. Conrad Longmire, a member of the Review Group, undertook a brief survey of the analysis effort accompanying an important recent underground test HURON KING. This test was notable for its effort to examine satellite vulnerability to System Generated EMP (SGEMP). While the size of the analysis effort was not abnormally low, we believe the ratio of theoretical to computational work was too low. The Review Group believes that a modest additional effort (perhaps \$500K on top of a \$25M test) would have been beneficial, for example, to better model solar cell and cable bundle response or to develop and apply theory to check the credibility of complex code results.

During the course of the review, the Group heard briefings on nearly all aspects of DNA's program. While it is foolhardy to judge the relative technical adequacy on the basis of the limited exposure provided by these briefings, the Review Group did form impressions of areas that appeared to be relatively strong and weak.

Areas that the Review Group judged to be relatively strong include:

1. Shock physics and dust
2. High altitude effects
3. Structural vulnerability and hardening
4. Electronic effects (TREE)
5. Radiation simulation techniques
6. Nuclear weapons employment, targeting and policy studies

With regard to the inter-agency VHSIC development, DNA's supporting activities under their TREE program appear to be adequately addressing important new technologies offering increased radiation hardening potential, such as configurable gate arrays.

Areas where the Review Group found DNA to be relatively less strong were:

1. Analysis of EMP coupling and effects, including SGEMP
2. Aircraft EMP
3. Advanced instrumentation for tests
4. Combined effect on personnel response
5. Collateral nuclear effects

In no case did the Review Group find evidence that technical weakness was due to staff incompetence or an unwillingness to explore new ideas.

The Review Group notes these impressions of the strengths and weaknesses in the DNA program and urges DNA to take these findings into account in the future.

The Review Group believes that DNA should strengthen its view of nuclear weapons effects as an engineering/scientific discipline. This means that the DNA program must include substantial effort on (1) theoretical development of subjects of importance to nuclear weapons effects, (2) documenting technical advances as they occur to the concerned community, (3) encouraging confrontation of ideas and peer reviews of research results. Most importantly it is essential for DNA to support quality research and to assure that scientific evidence is brought to bear on important policy issues, e.g, MX vulnerability.

Two points deserve special emphasis. First, the production of engineering handbooks is an important part of the documentation process which is especially valuable to users. Second, it is essential to assure quality control of the technical product. Adequate quality control cannot be assured simply on the basis of the judgement of technical project monitors (no matter how gifted) or by a restricted set of advisors. There must be some mechanisms for technical review that includes as broad an exposure to the concerned technical community as is possible.

Recommendation #7 DNA should include in its program more measures to strengthen the engineering underpinning of nuclear weapons effects.

Issue B What should be done about SGEMP vulnerability of satellites?

It is widely recognized that EMP and System Generated EMP (SGEMP) are critical to the survivability of military C³I systems. The potential vulnerability of C³ systems has only recently been

recognized by top policy-makers and it has led to a welcome program to upgrade our strategic C³ capability. The Review Group spoke to several authorities on C³ vulnerability including LTG Hillman Dickinson of the JCS who described the current view of the DNA role in this important area.

One aspect of the SGEMP problem became of central concern to the Review Group. This problem concerns satellite vulnerability and the proposal to build a \$100M facility termed the Satellite X-Ray Test Facility (SXTF) to "test" satellites for vulnerability to low levels of X-ray fluences. The SXTF facility was cancelled by USDRE during this study. While there are many reasons for the decision to cancel the facility, it is clear that an important reason was the unwillingness of the users, principally USAF, to agree to employ the facility.

The Review Group wishes to emphasize that at present there is no agreed program for resolving Satellite SGEMP vulnerability issues. This situation is not in the national interest and USDRE should put into place a mechanism for resolving outstanding differences and to develop a long-term plan which meets the national need. The problem will not be resolved without involvement of USDRE. What is required is a mechanism for providing an incentive for the services to understand SGEMP vulnerability of their systems and to adopt measures needed to fix these vulnerabilities.

The reasons for difficulty in formulating an acceptable satellite vulnerability program are largely due to the different interests of DNA and the user SPO's. DNA perceives the large technical uncertainties that must be resolved by an extensive R&D program involving testing and design iterations--as has been the case in all nuclear hardened systems ever built and paid for by the system project office. The SPO perceives the iterative R&D program for which he must pay as an unnecessary delay--the Air Force believes that the design methodology is in hand, in spite of the adverse results of STARSAT UGT. Furthermore the SPO views SXTF as possibly being used for certification testing rather than for design. Since there is a great deal of technical and threat uncertainty, it is understandable that the user is not enthusiastic about the prospect of the SXTF. There also is a debate about the value of testing at distant burst levels as it relates to various threat scenarios (all of which involve collateral kill, rather than direct attack--survival against which would require hardening to very high levels and is an impossible task.)

The Review Group believes SGEMP is a serious hardening issue warranting explicit, focused attention. The threat scenarios of interest are plausible (exposure from high altitude bursts, say ABM or EMP-inducing, which would occur in a nuclear war and ranging down to bursts associated with Soviet abrogation of the Atmospheric Test Ban Treaty--the latter being particularly embarrassing if US satellites go off the air). The US history of weapon system "failure" in first UGT exposures cannot be ignored and must be recognized as evidence of the need for a careful design-test-mod sequence in our programs.

As an alternate to proceeding with SXTF now, the Review Group believes it useful to consider a mini-SXTF, defined as a facility using the SXTF source technology, but a smaller test chamber. The test chamber should be adequate to test major satellite subsystems and key aggregations thereof in order to evaluate interface issues (where problems tend to arise). Emphasis could be centered on understanding and improving design methods. The facility should be expandable, so that if its utility is proven, user interests can be accommodated all the way through a full facility to do certification testing. The Review Group notes parenthetically that other facilities followed such a path (e.g., AURORA).

The focus of the strategy for the SXTF is environmental testing, i.e., the need for a facility that can reproduce, approximately, the threat environment of a satellite system. An alternative approach is to focus attention on developing and verifying a test protocol for certifying satellite hardness. Developing this test protocol would require combining theoretical analysis, simulation experiments, data from UGT's and results obtained from an environmental test facility. The mini-SXTF recommended here by the Review Group should be considered within the context of this broader approach.

There is one caveat to the foregoing. If satellite vulnerability from other sources than EMP, e.g., direct attack should be judged to be the primary threat, resources available for EMP vulnerability testing would be adjusted accordingly.

Recommendation #8 USDRE form and chair a joint committee with representation from DNA, USAF, USN and special projects to develop an acceptable long-range satellite vulnerability R&D program. Because of their experience in simulation technology DoE participation should be solicited. The plan should be directed toward developing R&D understanding of SGEMP phenomena, based on a mini-SXTF type facility, rather than to system configuration.

It is evident that over the long-term many different types of radiation simulation facilities of substantial size and expense will be required. It is important to note that DNA through its contractors (HDL, NRL, Maxwell Labs, Physics International) has one program for simulation technology and that DoE through its labs (primarily Sandia) has another. While competition is welcome, the cost of the simulation requires that a coordinated program be developed. Accordingly the Review Group recommends:

Recommendation #9 DNA and DoE (defense programs) should form a technical working group, composed of contractor and laboratory experts to formulate alternative programs and policies to establish a joint DoD/DoE National X-Ray Simulation Technology Program.

Issue C What is the Appropriate Role for DNA in the DSARC Process?

The preceding discussion emphasizes the need to consider more explicitly and formally the nuclear vulnerabilities of systems under development and entering acquisition. Despite acknowledgement that most military systems will need to survive on a nuclear battlefield, acquisition decisions have been made, especially for theatre nuclear systems and dual capable aircraft, without explicit consideration of nuclear hardness. Needless to say, it proves enormously more expensive to retrofit nuclear hardening measures than to design these measures into the system originally. However, it is understandable and appropriate that the project manager faced with cost and schedule constraints will make trade-offs that limit nuclear hardness. The problem is that there is no time certain in the acquisition cycle where these compromises with respect to nuclear hardness are reviewed. The point is not that there never is adequate attention to nuclear survivability; there is, especially for strategic nuclear systems. But there is no assurance that each system development or acquisition cycle includes a time where nuclear survivability issues are examined.

The DNA Charter provides authority for DNA leadership in the area of NWE technology, and by inference to an active role for DNA in the nuclear weapon system acquisition process:

Para. III.B.2. "The Director, DNA, will be responsible for... management of DoD nuclear weapons testing and nuclear weapons effects research programs."

Para. V. E. "Under its Director... DNA will perform the following functions: Plan, coordinate, and supervise the conduct of DoD nuclear weapons effects research and nuclear weapons testing, to include evaluation of the results of these programs."

DNA-DoD (laboratory and system sponsor/SPO) interaction could be greatly improved by more active participation by DNA in the acquisition process in those technical areas where DNA's unique capabilities are relevant and useful.

The Review Group believes that the DSARC process should include at one or more appropriate points explicit consideration of nuclear survivability of the system. The role of DNA in such a process is crucial. The Review Group does not believe that DNA should certify a specific level of nuclear hardness. The main reason, as discussed above, is that DNA cannot be expected to understand the choices that confront the program manager. The responsibility of DNA in this nuclear hardness DSARC review is to provide an analysis of the candidate systems for the DSARC board. This analysis should be a description of vulnerability and exploration of the measures and associated costs that would change this vulnerability up or down. Such an analysis hopefully would emerge from an on-going program between DNA and the weapon system program; it should not be an adversary analysis and DNA must guard against this possibility.

Accordingly the Review Group recommends:

Recommendation #10 The DSARC process should be modified to include at one or more milestones formal consideration of nuclear vulnerability (especially to EMP) of systems under development intended for acquisition. DNA should be charged with the responsibility of providing nuclear vulnerability analysis to the DSARC.

These comments have been directed to the acquisition process at the OSD level, i.e., DSARC. There are parallel service processes, e.g., ASARC, NSARC, and AFSARC. The Review Group, of course, intends this discussion and recommendation to apply to the services process as well.

Issue D Has DNA's move into the policy studies/nuclear employment area been productive?

The Review Group is aware that some have questioned the suitability of DNA entering the policy study/systems analysis area. The Review Group examined this issue in some detail and has reached several conclusions. First, the Review Group believes that the DNA sponsored work has been of generally high quality and that the size of the effort is not unreasonable. Second, the policy studies have been of direct value to senior OSD officials and to operational commanders who have no other source of analytic support. The testimony heard by the Review Group on this subject was quite

impressive. Third, the questions addressed in these studies are of direct relevance to the DNA mission of understanding nuclear weapons effects. Examples include targeting (SACEUR), weapons assignment, TNF force upgrade (PACOM), improved methods for assessing nuclear force C³ vulnerability. The Review Group believes that DNA would be ill-advised to adopt a narrow technical approach in their program without some attention to broader doctrinal, strategic, and political considerations.

It should be apparent that a successful R&D program must be guided by a complete understanding of the military context in which technology is to be used. Examples abound of R&D programs that have been undertaken without adequate consideration of the military utility of the effort. This not only results in wasted resources but also reflects a more serious misunderstanding of political military requirements. Without wishing to be argumentative one notes that the JCS satellite hardness requirements against X-rays is based on a concept of future space warfare that may or may not be correct. The hardness criteria for MX, other strategic nuclear systems, and tactical nuclear systems is based on both costs and estimates about the nature of the conflict situation that will involve nuclear systems. The use of tactical nuclear weapons on foreign territory raises issues of collateral effects. The connection between broad political/military analysis on systems analysis and on appropriate R&E programs that might make a significant difference is not remote. DNA is wise and fully justified to sponsor policy studies that this agency and other elements of DoD adopt intelligent and cost effective R&D programs.

Recommendation #11 The Review Group strongly endorses DNA's policy studies/systems analysis effort and notes the important contribution this effort has made to the DNA program, senior OSD officials and operational commanders.

There are two related subjects that the Review Group believes deserve attention. These are DNA support for nuclear arms control and nuclear targeting policy formulation.

These two areas have several features which are uniquely relevant to DNA's technical expertise:

--They represent two policy areas of the highest importance to the US

--Activity in these areas has been intense and is likely to remain so

--While they must in the last analysis be responsive to the broadest national policy objectives, most particularly including the foreign policy objectives of the nation, it is self apparent that US positions should be based on sound technical principles.

--One aspect common to both nuclear arms control and nuclear targeting is an understanding of the detailed technical phenomena associated with nuclear weapons systems.

Given these considerations it might be supposed that DNA's technical capabilities would automatically be called upon to support the developmet of policy in these areas. In fact, the Review Group believes actual support from DNA has been uneven, essentially because the policy levels in OSD and the JCS have not employed DNA as effectively as they might have.

Specifically by way of example, some US arms control negotiations such as SALT and TNF have benefited marginally if at all from direct DNA support. (DNA has not, for example, been included on intra- or interagency task forces responsible for developing US positions.) Conversely, DNA has been a key contributor to the development of the US position on CTB (through support of the JCS).

In a similar vein, since the late 60's the US Government has been heavily engaged in thinking through nuclear targeting policy for ooth strategic and theater weapons. Here DNA's technical background has been utilized, interestingly enough however, largely because DNA has taken special interest in these areas, rather than because OSD or the JCS have developed procedures for employing this expertise. DNA, working in part through external contractors and in some significant degree in response to military commanders in the field, has made an enormous contribution to providing research and expertise in support of policy in these areas. An example is DNA's response to CINCPAC's request in supporting a study of the PACOM theater nuclear force posture.

The example just cited has been replicated in other instances. However, such approaches are overly dependent upon the personal initiative of key individuals; e.g., the knowledge on the part of a particular CINCPAC that he could seek out assistance from DNA.

To some extent this approach will always be utilized. What seems to be required, however, is a somewhat more institutionalized role for DNA. OSD and the JCS should require DNA to participate as a supporting technical staff to nuclear arms control and nuclear targeting policy exercises conducted by the Government. This is a matter which must of course be decided upon by OSD and the JCS.

Until and unless a more structured institutional arrangement is decided upon, DNA should be encouraged to take maximum initiative in seeking out ways in which its technical programs can anticipate the need for supporting such policy areas. This may require an enhanced effort by DNA to learn what is going on in these policy areas, volunteering its support where it is not otherwise requested, and it may also require some measure of improvement in DNA technical support capabilities (although experience may demonstrate that present capabilities more than meet the needs).

The Review Group expresses the hope that the Chairman of the JCS, the USD for R&D and USD for policy will assure effective participation of DNA in on-going US Government studies and policy deliberations concerned with nuclear targeting policy and nuclear arms control.

Issue E Has the performance of Armed Forces Radiobiology Research Institute (AFRRI) been satisfactory?

AFRRI (Armed Forces Radiobiology Research Institute) is a disjoint element of DNA, whose job is to supply the biomedical data base and expertise necessary to properly plan for, and if necessary fight, a nuclear war. To do this, it has a budget of approximately ten million dollars (5% of DNA's total), an investment in capital equipment of about twenty million dollars, and a professional staff of about forty at the doctoral level. Of these latter, only three are medical doctors. The equipment includes a reactor, a linear accelerator, and a Co⁶⁰ source.

The current budget allocations and planned priorities reflect the conception of AFRRI and DNA management of its mission--60% of the budget is allocated to diagnosis and therapy, while 1% goes to the education of armed forces medical personnel on nuclear effects, and maintenance of the technology base is listed as a "Category D" priority for budget projections. Yet the members of the Institute take great pride in their research accomplishments.

The subject of radiobiology is a broad one, and the staff is consequently spread rather thinly across a number of specific and detailed subjects of interest. In some cases the importance is manifest (e.g., radioprotective drugs)--in others the Review Group was unable to judge whether they are personal "sandboxes" or carefully selected key issues. There is an acceptable publication rate--but, while this is one measure of the quality of the staff, it is not a measure of the relevance of the work to the mission.

Several deliberate choices appear to have been made to keep the overall level of effort within bounds, and it is not always clear at what level of integration they have occurred. For example, the work at the Institute is devoted entirely to high levels of radiation--the explanation was that no one else does this, and that plenty of people work on low-level effects. Yet much of the impact of nuclear war is due to low-level effects on the population, and one wonders where the information in support of national policies in this regard is aggregated.

Another dichotomy is that between ionizing and non-ionizing radiation, and AFRRRI has no work on the latter, except as combined effects of the two. (There was some work at one time in specific support of the SANGUINE system.) One can argue that there should somewhere be a military capability to understand non-ionizing radiation. This whole class of issues is not unrelated to the question of whether DNA should be in CW/BW, which is discussed above.

The Review Group came away from our necessarily brief survey of AFRRRI with the impression that the research is of good quality, but that it has been some time since the mission has been reconsidered. There is a need for the services (a need often unfulfilled) to prepare actually for war in a hostile environment, and this environment may well involve features in combination not now in the AFRRRI or even the DNA program. The Review Group does not recommend that the AFRRRI Charter be expanded and diluted, absent a resolution of these larger issues.

VI. Management Issues In this chapter the Review Group examines four management issues that emerged during the Group's inquiry.

Issue F Should the mission of DNA be expanded?

Several observers have noted that DNA's mission as defined by DoD Directive 5105.31, see Annex A, is relatively narrowly defined to nuclear weapons matters. This raised the question of the desirability to revise the directive to formulate a broader charter for DNA or to clarify certain aspects of DNA's role, e.g., in policy studies and/or intelligence.

The Review Group does not believe that the DoD directive, properly interpreted, is too narrow a charter for DNA. It is important to note that the mission of testing and of nuclear effects research are essentially linked; testing is not an end in itself but rather a means of continuously refining research needs and confirming research results. Moreover, testing and effects research are the essential underpinnings of DNA's ability to provide staff advice to

SECDEF, the JCS, and the military departments on system survivability and effectiveness. Thus the technical responsibilities of the Director, DNA in fact form a coherent mission that places DNA in a strong position to "provide advice, as appropriate to the Secretary of Defense, Military Departments, JCS, Unified and Specified Commands,... on the effectiveness of nuclear weapons; the vulnerability of military forces..." The Review Group does not believe that the existing directive unduly constrains DNA activities.

The Review Group took under consideration two major suggestions for expanding DNA's mission. The first proposal is to assign responsibility for chemical warfare (CW) and biological warfare (BW) to DNA. The second proposal is to assign responsibility for conventional munitions development to DNA. A variety of reasons may be put forward to support these proposals. Among these are (1) the importance of CW/BW and conventional munitions in the combined arms battlefield, (2) the inability of the present service laboratory system to develop new technology at the pace required, and (3) the greater technical competence of DNA and its contractors.

The Review Group believes that improved capability in CW/BW and conventional munitions development is an important problem for DoD. However, the Review Group is unanimous in the recommendation that:

Recommendation #12 DNA's charter should not be expanded to include primary DoD responsibility for CW/BW or conventional munitions.

The reasons that led the Review Group to this view are the following:

(1) DNA's present nuclear weapons effects mission is of vital importance; it should not be diluted or potentially weakened by the addition of other important responsibilities.

(2) DNA has little technical competence in the CW/BW area. There is little evidence to suggest that DNA involvement would lead to rapid progress on these important problems.

(3) The Review Group is of the opinion that there is some technical expertise on CW/BW and conventional munitions technologies in existing service labs (CSL, BRL, China Lake). In reality the problem of realizing greater innovation in CW/BW and conventional munitions may not be developing new DoD laboratory capability but rather making effective use in force structure development of existing technical expertise.

This recommendation should not be interpreted to imply that DNA should completely avoid CW or conventional munition issues. Indeed, given the character likely of the future integrated battlefield involving combined use of conventional, nuclear, and chemical weapons and the fact that technology is driving nuclear and conventional weapons to be substituted for certain target classes and uses, it is appropriate and desirable for DNA to undertake some work of this type. However the Review Group does not believe that it would be wise, at this time, to assign primary responsibility for these technologies to DNA.

Role of DNA in the Acquisition Process

With regard to DNA's role in the acquisition process, some change in the DNA Charter may be worth considering. This change would not preempt any of the service responsibility for nuclear weapon system acquisition. It would explicitly codify roles for DNA to provide:

- Coordination and oversight of expanded DoD laboratory participation in the NWE technology acquisition program.
- Review of proposed technical approaches to satisfy sponsor's weapon system requirements for survivability and hardening. (Perhaps reported as a DSARC condition.)
- Audit of weapon system technical compliance to the formal survivability and hardening requirements.

The latter task might be authorized by a very simple change to the present Charter, as follows:

Para. V. add: "Monitor and audit compliance to weapon system nuclear survivability and hardening criteria during weapon system acquisition."

Issue G Is the present DNA organization appropriate?

The DoD directive establishing DNA designates that the Director of DNA will be a three star general officer. The Director is responsible to the JCS for stockpile management functions and to the Undersecretary R&E for the nuclear weapons test and R&D activities. There is a civilian Deputy Director of DNA for S&T (appointed by the Secretary of Defense upon the Undersecretary's recommendation) that is the senior technical officer of DNA. The Undersecretary has assigned staff supervision for DNA to the Assistant to the Secretary

of Defense (Atomic Energy) although several officers in USD (R&E), especially strategic programs, has direct interest in the DNA program. Accordingly, USD (R&E) has established a DNA coordinating committee composed of ATSD(AE), the Director, DNA and Deputy USDR for C³I, Tactical Weapon Programs, and Strategic and Theatre Nuclear Force Programs.

The Review Group has considered the appropriateness of this organization given present concerns and requirements. There are several advantages to the present arrangement including the access which a senior military officer has in dealing with the JCS and military service users of the DNA product. Also, as suggested above, effective coordination arrangements have been established between DNA and those other Defense Department elements which have an interest in, or a contribution to make to, DNA areas of responsibility.

A related question which was considered was whether the present DNA organization and its position in the Defense Department hierarchy was conducive to attracting the strongest possible technical competence to the Agency. While as stated elsewhere in this report the issue of improving DNA's technical capabilities is highlighted, the Review Group was unpersuaded that any organizational change likely to be considered practical would have the effect of contributing to attracting increased technical competence to DNA. Accordingly, the Review Group proposes no change in the DNA organizational arrangement.

Issue H What is the appropriate role of DNA in intelligence analysis

DNA's technical expertise is essential to a proper analysis of Soviet capabilities and intentions. The intelligence analysis is especially required in net assessments and in studies of theater nuclear forces.

The Review Group is aware that DNA's activity in the intelligence area has been questioned from two quarters. First, DIA has suggested that it should carry out in-house some of the intelligence analysis of broader questions such as Soviet weapon employment policy that DNA currently undertakes with contract support. DIA suggests that greater reliance on its analysts would be more economical (without sacrificing timely response and quality) and would permit more complete use of sensitive intelligence material. In response, DNA and DIA have recently been exploring greater cooperation in intelligence.

While the Review Group encourages this new cooperative effort, it sees little merit in constraining DNA's activities aimed at intelligence analysis. No one has suggested that DNA's analysis of intelligence is not accurate and indeed many have noted its originality. This work should be continued and DIA should be encouraged to support it and to cooperate with DNA in this. Of course such intelligence analysis should not be represented to be finished intelligence or official estimates. Indeed DNA-sponsored intelligence analyses are only an input into the intelligence process. They should be labeled as raw intelligence and reference should be made, when available, to finished intelligence and community estimates.

Second, the Defense Audit Service (DAS) has suggested in a draft report that DNA is exceeding its charter (DNA is not a formal member of the intelligence community) by producing "finished intelligence" as defined by Executive Order 12036 and JCS Publication No. 1. We regard the DAS report as unfortunate in its reliance on definitions of analysis and production of intelligence that would effectively preclude any intelligence user from carrying out studies based on either raw intelligence data or approved estimates. DAS recommends that either DNA discontinue its intelligence analysis or that DNA be formally delegated to produce intelligence "under the control of DIA." The Review Group does not support this recommendation.

The analysis of foreign capabilities and intentions in the area of nuclear weapons requires collection of specific data and competent scientific examination. The competence of DNA personnel and its contractors to perform this function is unquestionable but it is also clear that the DNA area of expertise represents only a portion, and not the largest portion, of the war-fighting capabilities of a potential enemy.

Accordingly, the Review Group is convinced that a cooperation between DNA and DIA is absolutely essential. DIA should not be authorized to issue finished intelligence reports which include analysis of weapons effects without coordination with DNA. Conversely, DNA should not issue finished intelligence reports of any kind without specific authority given by DIA.

The output of DNA intelligence analysis or of the analysis of its contractors is usually not of an "all source" character and, if issued, should be labeled "non-evaluated results" or "raw data" or equivalent markings that distinguish clearly this DNA output from "finished intelligence."

Recommendation #13

The Review Group recommends that the Undersecretary of Defense (RE) confirm both the need and propriety of DNA's intelligence activities. DNA should not issue finished intelligence without specific authority from DIA and conversely DIA should not issue finished intelligence reports that deal with nuclear weapons effects without DNA coordination. DNA is encouraged to undertake analysis based on intelligence data provided it makes clear that such analysis are not finished intelligence.

Issue I DNA Procurement Practices

Recently both the Defense Audit Service (DAS) and the General Accounting Office (GAO) have criticized the contracting practices of DNA. Among the most important questions that have been raised are:

- (1) Reliance on unsolicited proposals for almost all DNA work.
- (2) Inadequate competition.
- (3) Reliance on inappropriate contract mechanisms and over use of "early starts."

DNA has responded aggressively to these criticisms and a number of "reforms" have been initiated in DNA procurement practices. The Review Group wishes to caution against an over reaction that could result in less responsive, flexible, and efficient contracting at DNA. The type of R&D program mounted by DNA does not easily fit into the traditional procurement framework. In the past, DNA's contracting practices have been praised as being an important factor in DNA's success in meeting user's needs and achieving technical advances in a timely and efficient manner. Most importantly, the procurement practices permit DNA to attract and retain outstanding contractors. The Review Group notes that an overwhelming number of the individuals it heard during its meetings, spoke favorably of past procurement practices and expressed concern about the future trends in contracting at DNA.

The underlying problem with reliance on unsolicited proposals is that procurement policy assumes for 6.2 R&D that government generated requirements result in work programs suitable for both sole source and competitive procurements. The procurement officer not familiar with the long term relationship between DNA and its performers does not understand how an R&D program can be formulated in terms of unsolicited proposals exclusively. It appears that the unsolicited proposals are the result of contact between DNA and the contractor which has the effect of restricting opportunity.

Early starts are not a good practice or popular with contractors, particularly in this time of high interest rates. Accordingly the Review Group is pleased to note that reliance on early starts has dropped from approximately 80% to 47% in FY 81 of contract actions.

DNA has relied upon CPFF contracts that are regarded as level of effort. Once the proposed hours have been expended the practice has been to modify the contract for new work rather than adding additional funds to cover uncompleted tasks. This practice does not provide an incentive for the contractor to control cost. However, the use of other contract mechanisms and project officer awareness of alternatives depends upon the availability of adequate contracting resources; both personnel and business systems. Improved performance in this area will probably require some additional contracting personnel and greater reliance on management information systems.

The principal point the Review Group wishes to stress is that DNA should guard against responding to the criticism of accountants who are unfamiliar with the DNA program by instituting inflexible new contracting procedures that will limit the laudable freedom of action of the agency.

Reliance on unsolicited proposals is not forbidden by any regulation provided this reliance does not exclude competition. A discussion with competent authorities in OSD reveals that it is in fact possible to maintain a competitive atmosphere and yet to deal with unsolicited proposals. A directive issued in 1964 by the OSD and signed by two ASD (Morris and Fubini) establishes the validity of the procedure; the directive is still in effect.

The Review Group wishes to make the following recommendation:

Recommendation #14. DNA should publish its technical needs in Commerce Business Daily and evaluate unsolicited proposals received in response to this notice thus providing more visible opportunity for competition. Second, DNA should assure that adequate administrative personnel and business information systems are available to support the R&D program in a timely and efficient manner.

VII. Concluding Remarks

The Review Group has enjoyed its contact with the DNA technical staff who have been especially cooperative and stimulating. This DNA staff is a competent and dedicated group of professionals who deserve favorable recognition by the DoD community. In addition the Review Group wishes to express its appreciation to the Director, DNA, LTG Harry Griffith, the Deputy Director, Dr. Ed Conrad and BG Brown, Commander, Field Command, for their cooperation. The able service of Dr. Eugene Sevin as Executive Secretary of the Review Group is also gratefully acknowledged.

Annex A - DoD Directive 5105.31



November 3, 1971
NUMBER 5105.31

ASD(C)

Department of Defense Directive

SUBJECT Defense Nuclear Agency (DNA)

- References:** (a) DoD Directive 5105.31, "Defense Atomic Support Agency (DASA)," July 22, 1964 (hereby cancelled)
- (b) DoD Directive 4145.20, "Environmental Criteria and Design Standards for Atomic Weapons Storage and Maintenance Facilities," November 29, 1961 (hereby cancelled)
- (c) DoD Directive 5154.4, "The Department of Defense Explosives Safety Board," October 23, 1971
- (d) DoD Directive 5030.2, "Procedure for Handling Joint AEC-DoD Nuclear Weapons Development Projects," October 26, 1962

I. GENERAL

Pursuant to the authority vested in the Secretary of Defense, the Defense Nuclear Agency (DNA) is established as a designated agency of the Department of Defense (DoD) under the direction, authority, and control of the Secretary of Defense.

II. ORGANIZATION

DNA will consist of:

- A.** A Director, a Deputy Director (Operations and Administration), a Deputy Director (Science and Technology), and a headquarters establishment.

- B. Such subordinate units, field activities, and facilities as are established by the Director, DNA, or are herein or hereafter assigned or attached specifically to DNA by the Secretary of Defense.

III. MISSION AND RESPONSIBILITIES

- A. The mission of DNA is to provide support to the Secretary of Defense, the Military Departments, the Joint Chiefs of Staff, and other DoD Components, as appropriate, in matters concerning nuclear weapons as provided herein and such other aspects of the DoD nuclear program as may be directed by competent authority.
- B. The Director, DNA, will be responsible for:
 - 1. Consolidated management of the DoD nuclear weapons stockpile in accordance with the functions assigned herein.
 - 2. Management of DoD nuclear weapons testing and nuclear weapons effects research programs. (This does not affect the basic Service responsibility for all aspects of specific weapons system development).
 - 3. Providing staff advice and assistance on nuclear weapons matters within his cognizance to the Secretary of Defense, the Military Departments, the Joint Chiefs of Staff, other DoD Components, and government agencies, as appropriate and when requested.

IV. SUPERVISION

Staff supervision of DNA for the Secretary of Defense will be provided as follows:

- A. The Joint Chiefs of Staff, acting through the Director, DNA, will exercise primary staff supervision over

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DNA activities, except as prescribed otherwise herein. Specifically, they will:

1. Exercise staff supervision over the military operational aspects of DNA activities, including:
 - (a) composition of the nuclear stockpile;
 - (b) allocation and deployment of nuclear weapons;
 - (c) military participation in and support of nuclear testing; (d) frequency of technical standardization inspections; and (e) requirements for technical publications.
 2. Review and provide military advice on the adequacy of the DNA efforts in nuclear weapons testing and nuclear weapons effects research which is related directly to military systems considered in the Joint Strategic Objectives Plan, Joint Force Memorandum, and Nuclear Warhead Development Guidance.
- B. The Director, Defense Research and Engineering (DDR&E) will exercise staff supervision through the Director, DNA, keeping the Director, Joint Staff, informed, of DNA activities associated with the DoD nuclear weapons effects research and nuclear weapons test programs.
- C. The Assistant to the Secretary of Defense (Atomic Energy) will exercise staff supervision through the Director, DNA, keeping the Director, Joint Staff, informed, of DNA activities associated with: (1) technical nuclear safety; (2) logistics aspects of nuclear weapon stockpile management; (3) the application of nuclear energy in other than the weapons field; (4) the transmission of information to the Joint Committee on Atomic Energy, as required by the Atomic Energy Act of 1954, as amended; and (5) agreements between the DoD and the Atomic Energy Commission (AEC) on appropriate nuclear matters. In his role as Chairman of the Military Liaison Committee (MLC), the ATSD(AE) will exercise staff supervision through the Director, DNA, of DNA activities associated with DNA support of the MLC.

V. FUNCTIONS

Under its Director, and in accordance with the assignments of responsibility specified in Paragraph III., above, DNA will perform the following functions:

- A. Maintain overall surveillance and provide guidance, coordination, advice, or assistance, as appropriate, for all nuclear weapons in DoD custody, including production, composition, allocation, deployment, movement, storage, maintenance, quality assurance and reliability assessment, reporting procedures, and retirement.
- B. Provide advice and assistance, as appropriate, to the Secretary of Defense, Military Departments, Joint Chiefs of Staff, Unified and Specified Commands, and other government agencies on the effectiveness of nuclear weapons; the vulnerability of military forces, installations, and systems against nuclear weapons effects; and radiological defense activities. In this connection, when directed by the DDR&E, DNA will serve as DoD coordinator for work in selected technological areas related to nuclear vulnerability activities conducted by the Military Departments or other DoD Components.
- C. Provide nuclear weapon stockpile information to the Joint Chiefs of Staff as required.
- D. Provide nuclear warhead logistic information to authorized DoD organizations.
- E. Plan, coordinate, and supervise the conduct of DoD nuclear weapons effects research and nuclear weapons testing, to include evaluation of the results of these programs.
- F. Develop, coordinate, and maintain the national nuclear test readiness program jointly with the AEC and perform associated technical, operational, and safety planning.

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- G. Develop, coordinate, and conduct test exercises, overseas nuclear tests, and other nuclear-related operations, as directed. Arrange for mutual AEC-DoD support of AEC, DoD, or joint nuclear weapons tests.
- H. Act as the central coordinating agency for the DoD with the AEC on nuclear weapon stockpile management, nuclear weapon testing, and nuclear weapons effects research within approved policies and programs and in consonance with the statutory provisions for the MLC and pertinent DoD-AEC agreements.
- I. Conduct technical standardization inspections of units having responsibilities for assembling, maintaining or storing nuclear weapons, their associated components and ancillary equipment. Inspections will be performed on a selective sampling basis of nuclear capable units assigned to every major command in the Department of Defense. The Joint Chiefs of Staff will determine the frequency of such inspections. Inspection schedules will be coordinated with the major or component commands and the Service concerned.
- J. Command the Armed Forces Radiobiology Research Institute (AFRRI).
- K. Maintain and operate a Joint Nuclear Accident Coordinating Center (JNACC), in conjunction with the AEC.
- L. Operate the Joint Atomic Information Exchange Group (JAIEG) in accordance with policy guidance furnished jointly by the ATSD(AE) for the DoD and the Assistant General Manager for Military Application for the AEC.
- M. Perform for the DoD: (1) integrated materiel management functions for all AEC special designed and quality controlled nuclear ordnance items and for Service designed and quality controlled nuclear ordnance items where such management is mutually agreed upon between DNA and the appropriate Service, or as directed by the Assistant Secretary of Defense (Installations and Logistics); (2) management of

Continuation of V. M.

that portion of the Federal Cataloging Program pertaining to nuclear ordnance items including the maintenance of the central data bank and the publication of Federal Supply Catalogs and Handbooks for all nuclear ordnance items; (3) as the DoD assignee, the standardization of nuclear ordnance items in coordination with the appropriate Service; (4) management of the AEC-DoD loan account for nuclear materials; and (5) management of a technical logistics data and information program.

- N. Perform technical analyses and studies for the Secretary of Defense, the Military Departments, and the Joint Chiefs of Staff of nuclear related problems; prepare and coordinate implementing directives and joint technical publications when requested. DNA will provide analysis and study results to Defense Components, as appropriate, when such results are pertinent to stated requirements.
- O. In coordination with the AEC and the Military Departments, disseminate technological information of joint interest relating to nuclear technology, development, and weapons through laboratory liaison, technical reports, and nuclear weapons technical publications. Publications pertaining to specific weapons will be the responsibility of the lead Service for the weapon concerned.
- P. Provide technical assistance and support to the Secretary of Defense, the Military Departments, and the Joint Chiefs of Staff in developing nuclear warhead safety requirements and reviewing and processing safety rules for nuclear weapons systems. When appropriate, coordination will be effected with the Department of Defense Explosives Safety Board. (See DoD Directive 5154.4 (reference (c))).
- Q. Within guidelines established by the Joint Chiefs of Staff, investigate and recommend DoD security and safety standards and operating procedures.
- R. Develop, prepare, and publish, in coordination with the AEC, Military Departments, and the Department of Defense Explosives Safety Board, appropriate guidance,

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environmental criteria, and design standards for the construction of facilities to be used for the storage and maintenance of nuclear weapons.

- S. Perform such other functions as may be assigned by the Secretary of Defense.

VI. AUTHORITY

The Director, DNA, is specifically delegated authority to:

- A. Command the Defense Nuclear Agency.
- B. Have access to and direct communications with all DoD Components and, after appropriate coordination, with other organizations.
- C. Exercise the administrative authorities contained in Enclosure 1 of this Directive.

VII. RELATIONSHIPS

- A. In the performance of his function, the Director, DNA, will: (1) coordinate actions as appropriate with other Components of the DoD and those departments and agencies of government having related functions; (2) maintain appropriate liaison for the exchange of information and findings related to his assigned responsibilities; (3) make maximum use of established facilities, procedures, and channels for logistic support, procurement, accounting, disbursing, investigative, and related administrative operations; (4) obtain information from any Component of the DoD which is necessary for the performance of DNA functions; and (5) insure that the Military Departments, Joint Chiefs of Staff, and appropriate OSD staff elements are kept fully informed concerning DNA activities.
- B. The Military Departments and other DoD Components will: (1) provide assistance within their respective fields of responsibility to the Director, DNA, in carrying out

his assigned responsibilities and functions; (2) coordinate with DNA all programs which include or are related to nuclear weapons effects research or nuclear weapons testing; (this includes specifically keeping the Director, DNA informed of systems response to nuclear weapons effects) (3) keep the Director, DNA, informed as to the substance of their major actions being coordinated with other DoD Components, AEC and its laboratories, and other government agencies which relate to DNA functions; and (4) provide the Director, DNA, with requirements for nuclear weapons effects research and nuclear weapons testing.

VIII. ADMINISTRATION

- A. The Director, DNA, will be a lieutenant general or vice admiral appointed by the Secretary of Defense, upon recommendation of the Joint Chiefs of Staff. Normally, the position of Director will rotate among the Services.
- B. The Deputy Directors will be appointed by the Secretary of Defense. When military officers, the Deputy Directors will be recommended by the Joint Chiefs of Staff and will normally be selected from Services different from that of the Director. Civilian Deputy Directors will be recommended by the DDR&E.
- C. DNA will be authorized such personnel, facilities, funds, and other administrative support as the Secretary of Defense deems necessary.
- D. The Military Departments will assign military personnel to DNA in accordance with approved Joint Manpower Program authorizations. Procedures for such assignments will be as agreed upon between the Director, DNA, and the individual Military Departments.

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IX. EFFECTIVE DATE AND CANCELLATION

This Directive is effective upon publication. References (a) and (b) are hereby superseded and cancelled. Reference (d) will be revised to reflect changed LNA functions.

A handwritten signature in black ink, appearing to read "Richard B. Cheney", is written over the title of the Deputy Secretary of Defense.

Deputy Secretary of Defense

Annex B - Terms of Reference



RESEARCH AND
ENGINEERING

THE UNDER SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301

22 JUN 1981

MEMORANDUM FOR CHAIRMAN, DEFENSE SCIENCE BOARD

SUBJECT: Defense Science Board Task Force on the Defense Nuclear
Agency Technology Base Program

1. You are requested to undertake a comprehensive review of the Defense Nuclear Agency NWE Technology Base Program, including all important areas of nuclear weapons effects phenomenology such as blast and shock, cratering, EMP, SGEMP, free-field environments, as well as the coupling effects and the response of generic systems to these effects.

2. Critical questions to be addressed by the Task Force include:

a. Is the DNA TBP responsive to DoD needs for nuclear weapons effects (NWE) information?

b. Is proper emphasis being placed on emerging technologies? High risk/high payoff areas?

c. Is there an appropriate balance in the use of government laboratories, industrial R&D laboratories and universities?

d. How can the effectiveness of DNA's information dissemination and technology transfer efforts be improved?

At the discretion of the Task Force Chairman even broader aspects of the technology base program involving intelligence use and processing, threat definition, countermeasures, etc., may be included. All work associated with this review including final report and briefings should be completed by 31 December 1981.

3. At the end of the review the Task Force Chairman will make an oral report of the results to the Director and staff of DNA, and to the (19-23 October 1981) meeting of the DNA Scientific Advisory Group on Effects (SAGE). At the request of the Director, DNA, the written report will be briefed by the Task Force Chairman to key decision makers and interested individuals.

4. The members of the DSB Task Force on DNA TBP will be members of an approved subgroup of the Defense Science Board (DSB). The members will be appointed as DSB consultants for the duration of this effort. Reimbursement for travel, per diem, and consultant wages will be made by DNA to the subgroup members following procedures outlined by the DSB.

5. This Task Force will be sponsored by Lieutenant General Harry A. Griffith, USA, Director, Defense Nuclear Agency. Professor John Deutch, MIT, has agreed to serve as Chairman and Dr. Eugene Sevin, DNA/DDST, will serve as Executive Secretary.

A handwritten signature in cursive script, appearing to read "Dick McTear".

Annex C - List of DSB Task Force Members

DEFENSE SCIENCE BOARD TASK FORCE ON TECHNOLOGY BASE PROGRAM

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Annex D - Agendas of Meetings

Defense Science Board Task Force on
DNA Technology Base Program

Agenda

Monday, 6 July

0900-0930	Organizational Session	Task Force Members
0930-1000	Welcome and Terms of Reference	LTG Griffith
1000-1100	DNA Science & Technology Activities	Dr. Edward Conrad
	Coffee Break	
1100-1200	Discussion	
1200-1300	Lunch	
1300-1600	ROD&E Program Overview Radiation Research Shock Physics Research Biomedical Research	Col R. Lewis COL E. Frankhouser Dr. E. Still
1600-1630	Executive Session	

Tuesday, 7 July

0900-1015	UST Experience	Dr. Knowles
1015-1045	Biomedical Research	Dr. Still
1045-1130	Mech of Radiation Damage	Dr. Hagan
1130-1200	Dust	Capt Lunn
1200-1250	Executive Session	

DSB Task Force on DNA TBP
8-9 September 1981
Agenda

8 September

0900-1000	Executive Session	
1000-1100	Discussion with T. K. Jones	
1100-1200	Discussion with RADM Burkhalter	
1200-1300	Lunch	
1300-1400	Discussion with Andy Marshall	
1400-1500	Discussion with Jim Wade	
1600-1700	Intelligence Related Programs	M. Rubenstein

9 September

0800-0830	Executive Session	
0830-0945	NWE Data Base: Dust Phenomenology	G. Ullrich ✓
0945-1100	NWE Data Base: High Altitude Effects	G. Soper (L. Wittwer) (R. Gullickson) (G. Baker)
1100-1200	Discussion with VADM Carr	
1200-1300	Lunch	
1300-1330	Aircraft EMP	T. Seale
1330-1400	C ³ Vulnerability and Hardening	P. Fleming
1400-1500	Discussion with LTG Dickinson	
1500-1530	SXTF - New Directions	G. Soper
1530-1600	Executive Session	

DSB Task Force on DNA TBP
25-26 October 1981
Agenda

Sunday, 25 October

1000-1100	A/C EMP Hardening	Dr. Soper
1100-1200	Baccarrat (Advanced Simulation)	Maj Seale
1200-1300	Executive Session	Mr. Farber
1300-1345	Discussion with Dr. Davidson, USANCA	Capt Soo
1345-1415	Baccarrat (Photon Sources)	
1415-1500	UGT Experimentation (HURON LANDING)	Maj Gullickson
1500-1545	Satellite Hardening R&D Plan	Mr. Souders
		Capt Lutz

Monday, 26 October

0830-0930	Report on DNA's SGEMP Program	Dr. Longmire
0930-1000	Report on DNA-DoE/DoD Lab Relations	Dr. Kerr
		RAADM Wertheim
1000-1100	Discussion with MG McCartney, BMD/MX	
1100-1130	Discussion with GEN Blanchard	
1130-1200	Continuation of 0930-1000 Discussion	
1200-1330	Discussion with VADM Monroe, NOP-98	
1330-1430	Discussion with MG Enney, SAC/IN	
1430-1515	Target Vulnerability Program	Dr. Goering
1515-1600	Blast & Shock Simulation Program	Maj Furbee
1600-1630	Executive Session	

DSB Task Force on DNA TBP
16-17 November 1981
Agenda

Monday, 16 November

0930-1000	Executive Session	
1000-1100	Discussion with RDA Personnel	
1100-1200	Discussion with BDM Personnel	
1200-1230	HURON KING SGEMP Experiment	Dr. Longmire
1230-1300	Lunch	
1300-1400	Discussion with TRW Personnel	
1400-1500	Discussion with Lockheed Personnel	
1500-1600	Executive Session	

Tuesday, 17 November

0830-0915	Executive Session	
0915-1000	Procurement Policies	LtCol Douglas
1000-1100	Discussion with SNL Personnel	
1100-1200	Discussion with AFWL Personnel	
1200-1230	Lunch	
1230-1400	Executive Session	

Defense Science Board Task Force on
DNA Technology Base Program
29-30 December 1981

Agenda

Tuesday, 29 December

0900-1000	Executive Session
1000-1130	DNA Field Command Activities
1130-1230	Lunch
1230-1630	Executive Session

Wednesday, 30 December

0830-1200	Executive Session
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